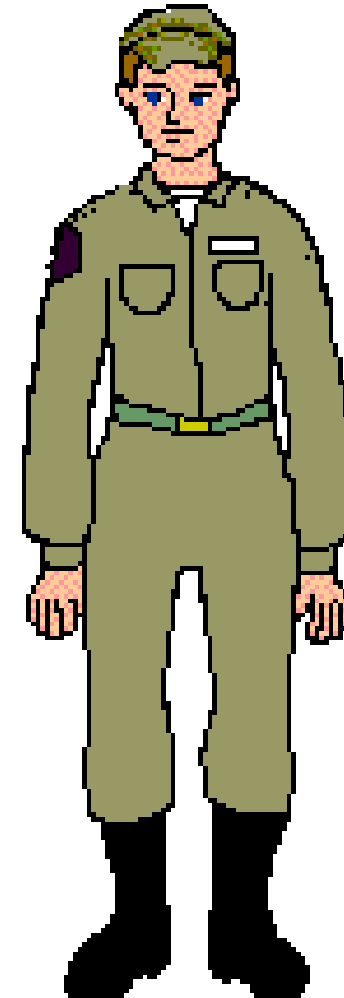




## Armed Forces College of Medicine AFCM





# **Thoracic Wall**

## **“Intercostal Nerves & Vessels”**

**By**  
**Prof Azza Kamal**

# Intended Learning Outcomes

By the end of this lecture, each student should be able to:



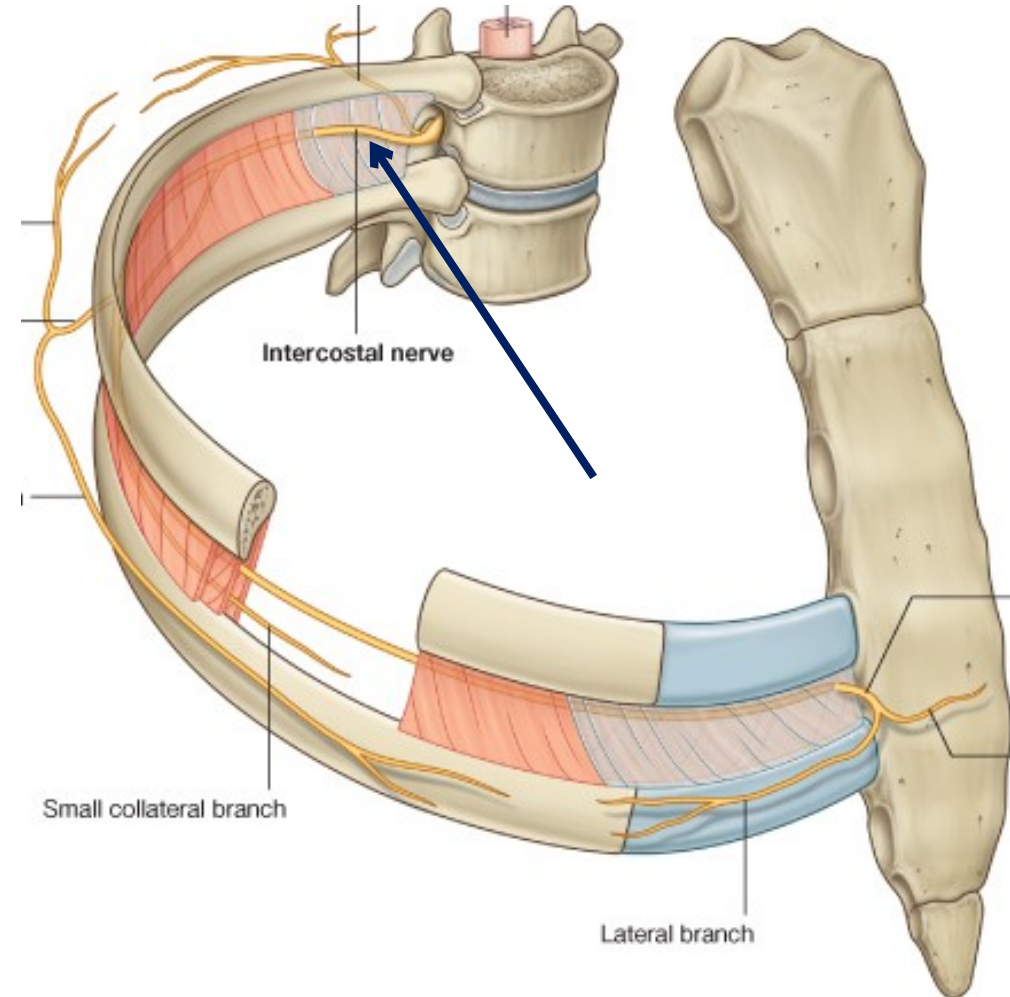
1. **Outline** the course & branches of the **typical & atypical** intercostal nerves.
2. **Describe** the clinical importance of these nerves in cases of intercostal nerve block & thoracocentesis.
3. **Describe** the origin, course and branches of the anterior and posterior intercostal arteries.
4. **Describe** the origin, course, termination and branches of the internal thoracic artery with special emphasis on its relevant clinical application.
5. **Describe** the beginning, course and termination of the anterior and posterior intercostal veins .
6. **Outline** the azygos and hemiazygos veins.
7. **Outline** the formation and termination of the internal thoracic vein.

## **KEY POINTS OF THE LECTURE**

- 1. Typical & atypical intercostal nerves**
- 2. Intercostal nerve block & thoracocentesis**
- 3. Anterior and posterior intercostal arteries**
- 4. Internal thoracic artery & internal thoracic vein**
- 5. Anterior and posterior intercostal veins**
- 6. Azygos and hemiazygos veins**

# Intercostal Nerves

- They are **ventral rami** of the 12 pairs of thoracic nerves.
- Last one (number 12) passes below the last rib – so called the **subcostal n**
- They are divided into typical & atypical :
- T 3to 6 n have similar course & distribution so are called **typical intercostal n**
- T1 T2 and T7-T11 are



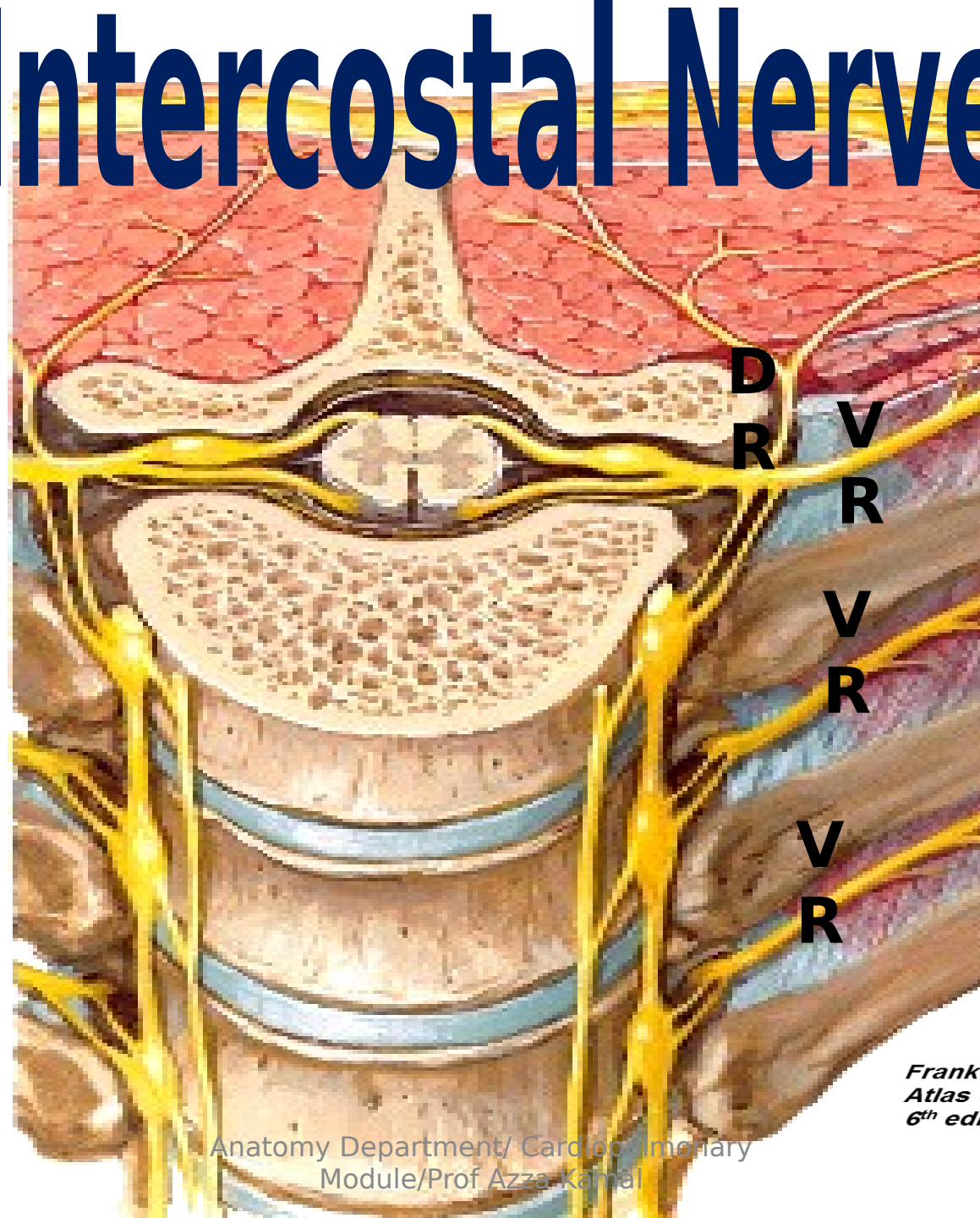
[https://lh3.googleusercontent.com/b6d150PjGjcXc5aMsJZ6P3b\\_92](https://lh3.googleusercontent.com/b6d150PjGjcXc5aMsJZ6P3b_92)



# Intercostal Nerve



**DR =  
dorsal  
ramus**



**VR =  
ventral  
rami**

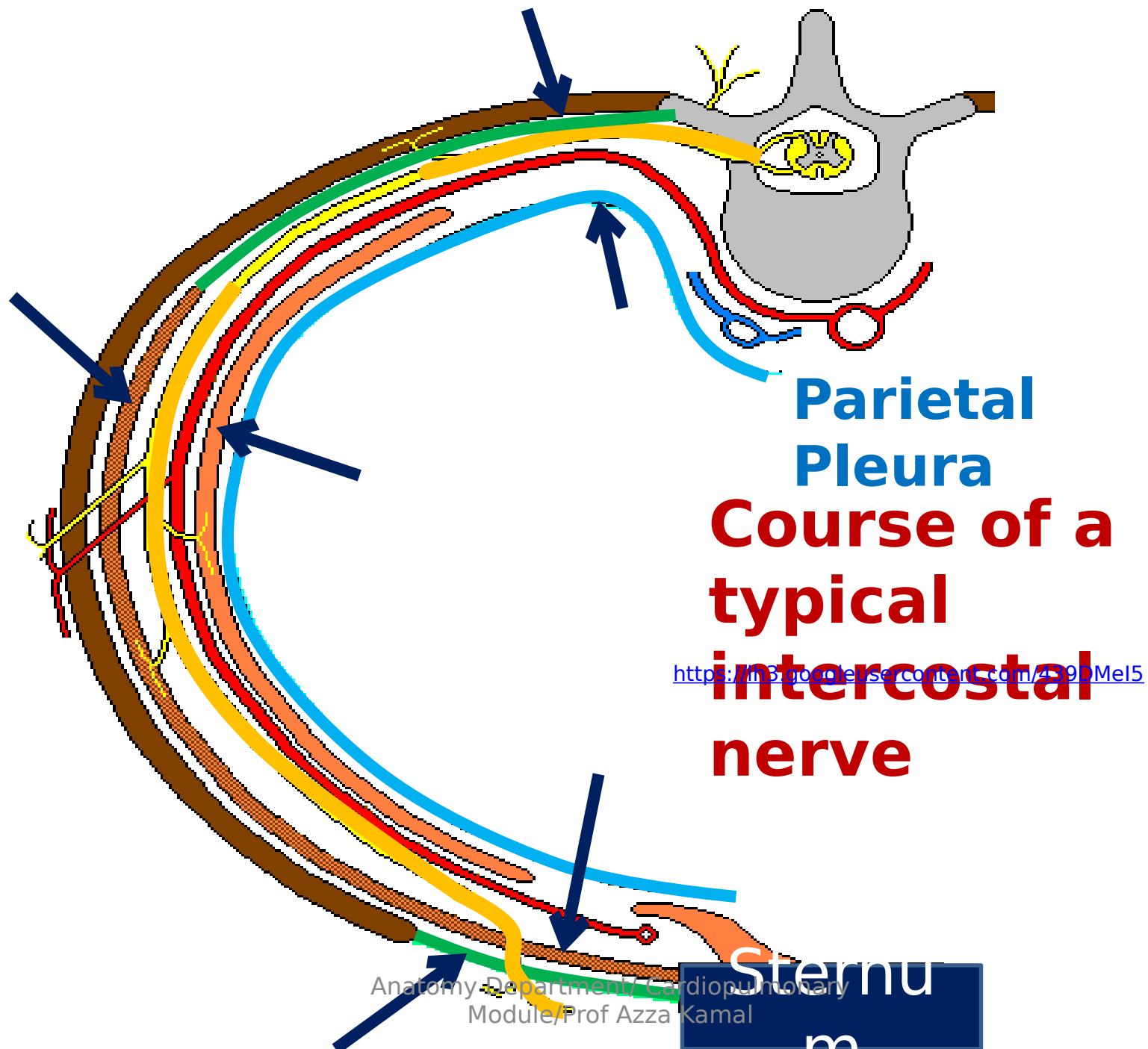
*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

# Course of typical intercostal nerve



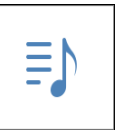
- 1. Each nerve emerges from the corresponding intervertebral foramen**
- 2. Passes between parietal pleura & posterior intercostal membrane**
- 3. Then it passes between innermost intercostal & internal intercostal**
- 4. Just next to the sternal margin it pierces internal intercostal, anterior intercostal membrane, pectoralis major & its covering deep fascia to end as the anterior cutaneous nerve**

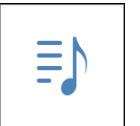
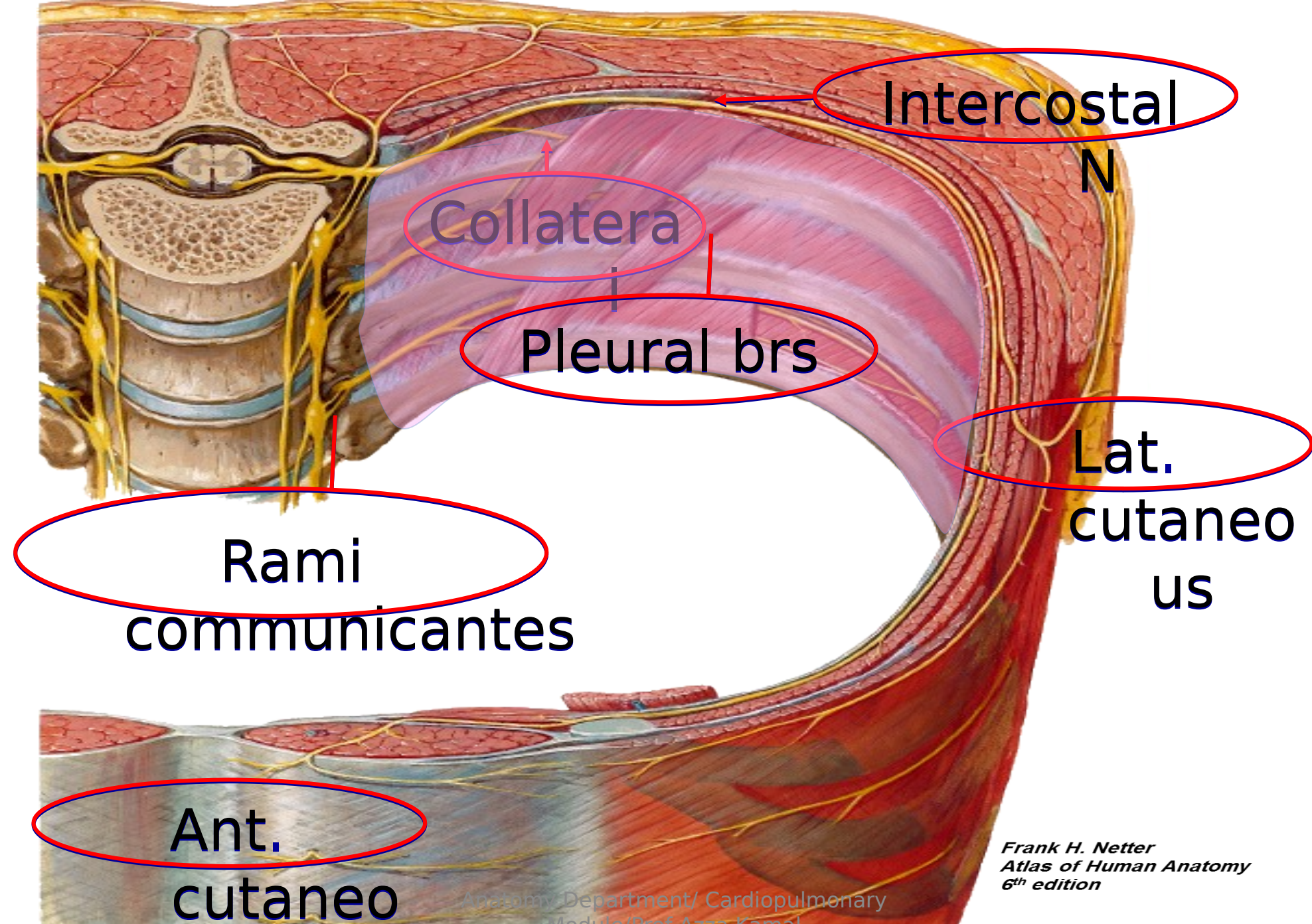




# Branches of intercostal nerves

1. **Rami communicantes** □  
to & from sympathetic ganglia
2. **Collateral branch** □  
upper border of rib below
3. **Pleural branches**  
□ parietal pleura
4. **Muscular brs** □  
intercostal muscles
5. **Lateral cutaneous**





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# Atypical intercostal nerves

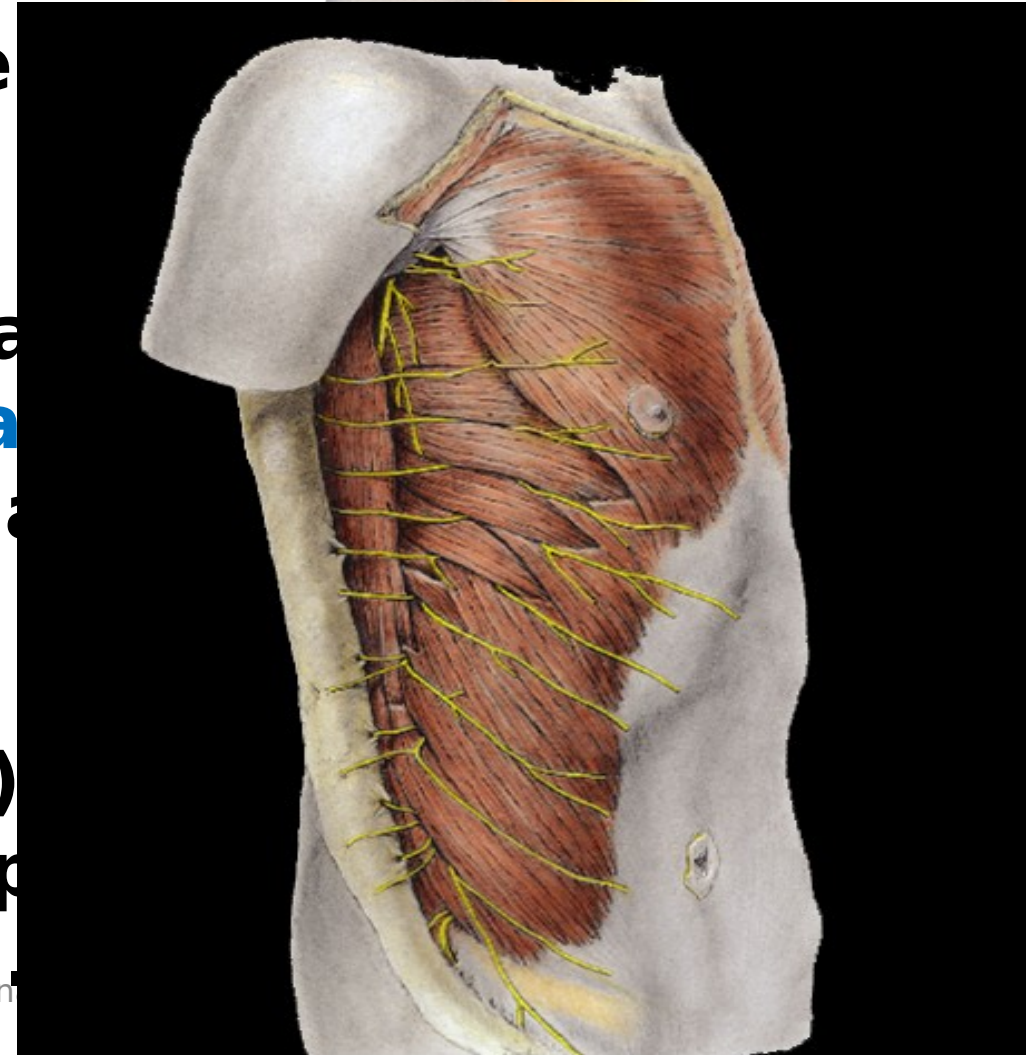


- ❖ **1st intercostal nerve T1** □ divides into:
- ❖ **Large branch** □ brachial plexus
- ❖ **Small branch** □ 1<sup>st</sup> intercostal space gives no lateral cutaneous branch.

- ❖ **2<sup>nd</sup> intercostal nerve T2** □ its lateral cutaneous br is called **intercostobrachial nerve** □ supplies skin of floor of axilla & upper part of medial side of arm.

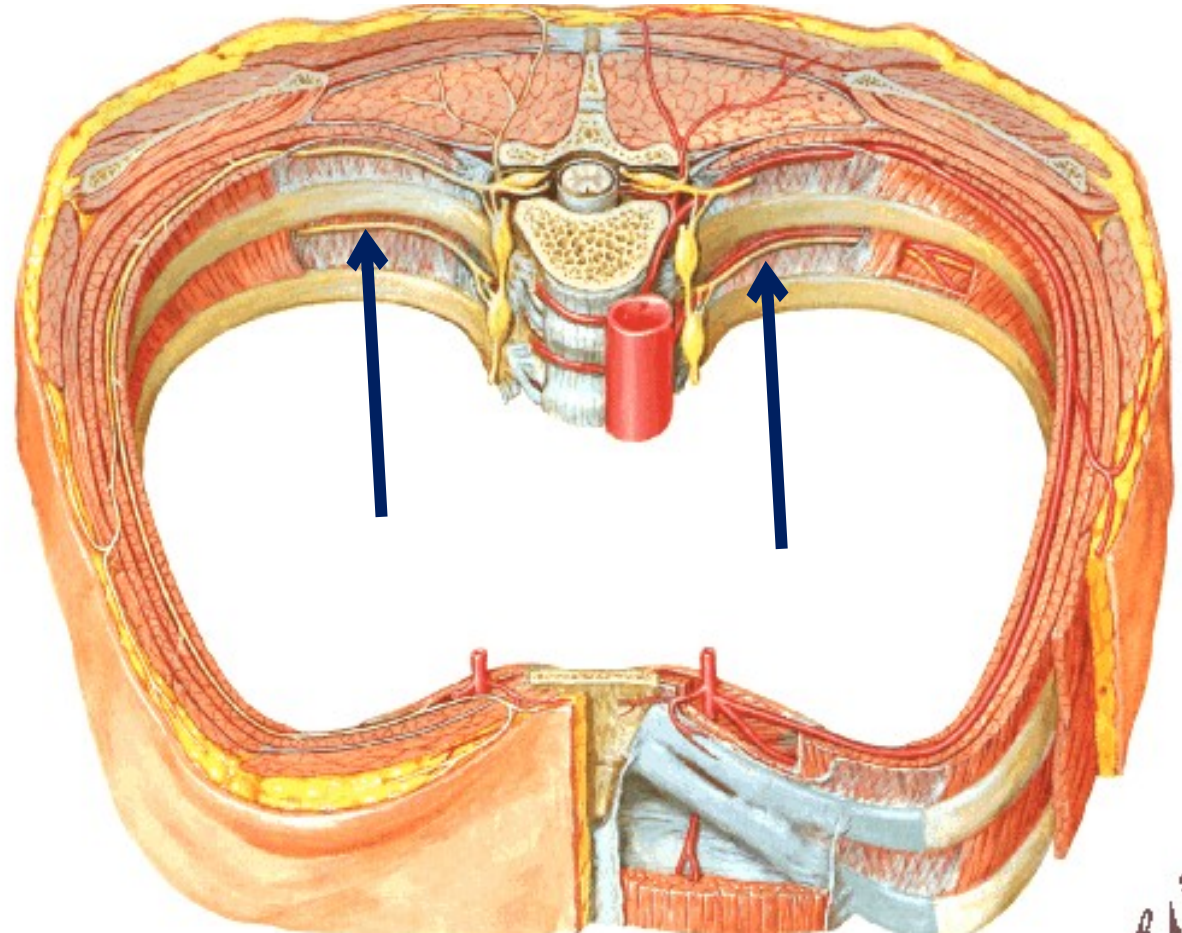
- ❖ **Lower 5 intercostal nerve (T7-T11)** □ supply the anterior abdominal wall to supply muscles, skin & parietal peritoneum.

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Atlas of Human Anatomy  
6<sup>th</sup> edition





- Intercostal nerves and vessels lie **midway** between the 2 ribs in the **posterior parts** of the intercostal spaces.
- In the **lateral parts** of intercostal spaces, the intercostal nerves & vessels are protected by the ribs as they run inside the **costal**



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

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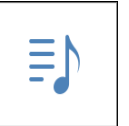
**The 3rd intercostal nerve ends next to the sternal margin by becoming the following nerve**

- A) Lateral cutaneous**
- ☒ B) Anterior cutaneous**
- C) Pleural branch**
- D) Collateral branch**
- E) Rami communicantes**

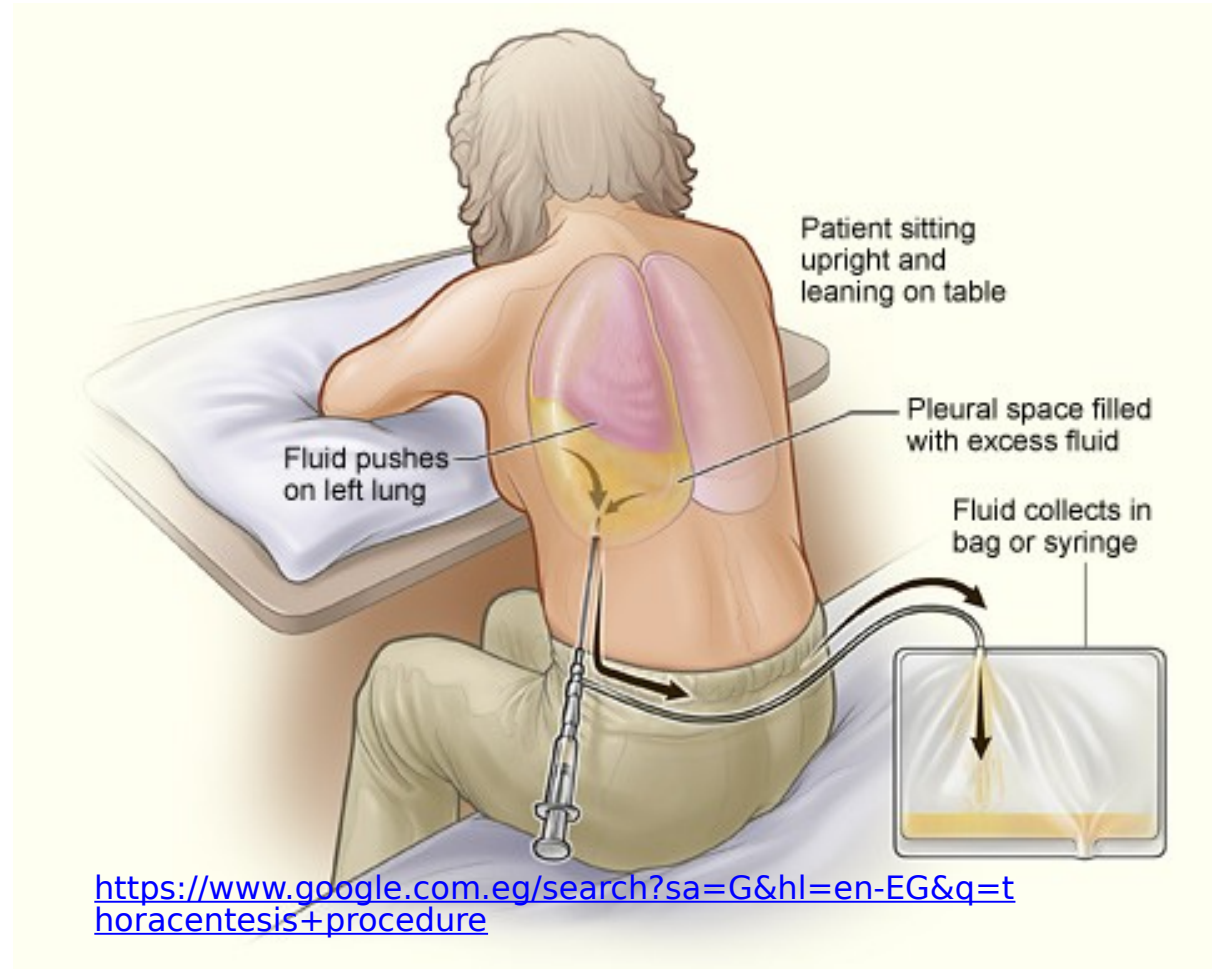
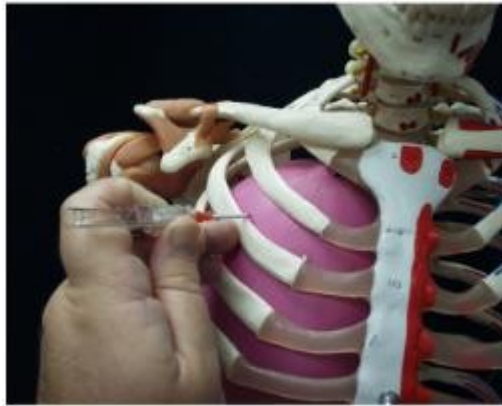
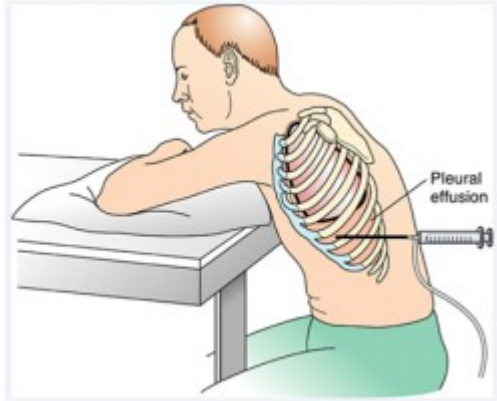
**MCQ tests typical and atypical intercostal nerves**



- **Stab wounds through posterior parts of intercostal spaces are more dangerous than stab wounds in lateral parts of the intercostal spaces, WHY ?**
- **Where is a safe site to introduce a puncture needle ( thoracocentesis) in the intercostal space ?**



# TAKE HOME MESSAGE



**Thoracocentesis is inserting a needle into pleural cavity to remove fluid (pus/blood). To avoid injuring intercostal VAN, the needle is inserted**

# Intercostal Nerve Block

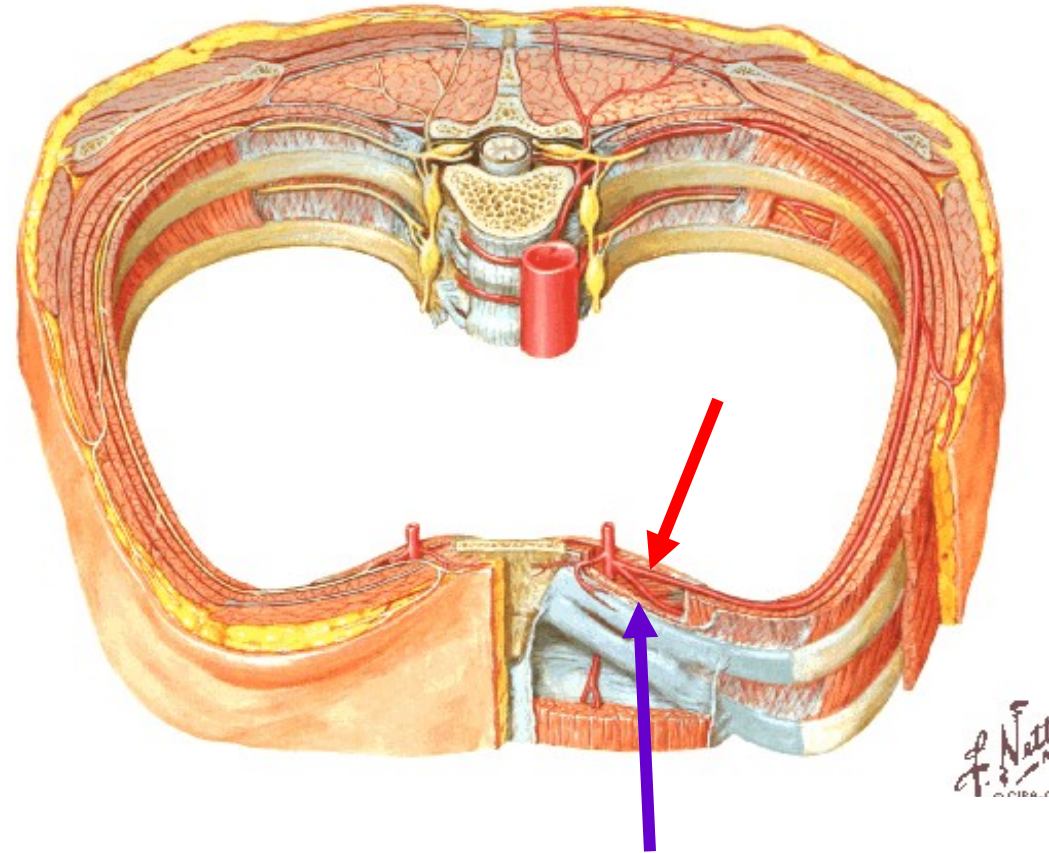
**Herpse zoster ( shingles) is a viral disease of spinal ganglia which produces sharp burning pain in the skin of chest. You may need to inject a local anaesthetic in the intercostal space to relieve the pain. You should insert the needle just lateral to the vertebra concerned , so that the anaesthetic goes around the intercostal nerve trunk.**





# Intercostal Arteries

- **Anterior intercostal arteries** □ 2 arteries in each space, except last 2 spaces which have no arteries since the last 2 spaces are incomplete anteriorly.
- One artery passes on **lower border of rib above**, the other on **upper border of rib below**

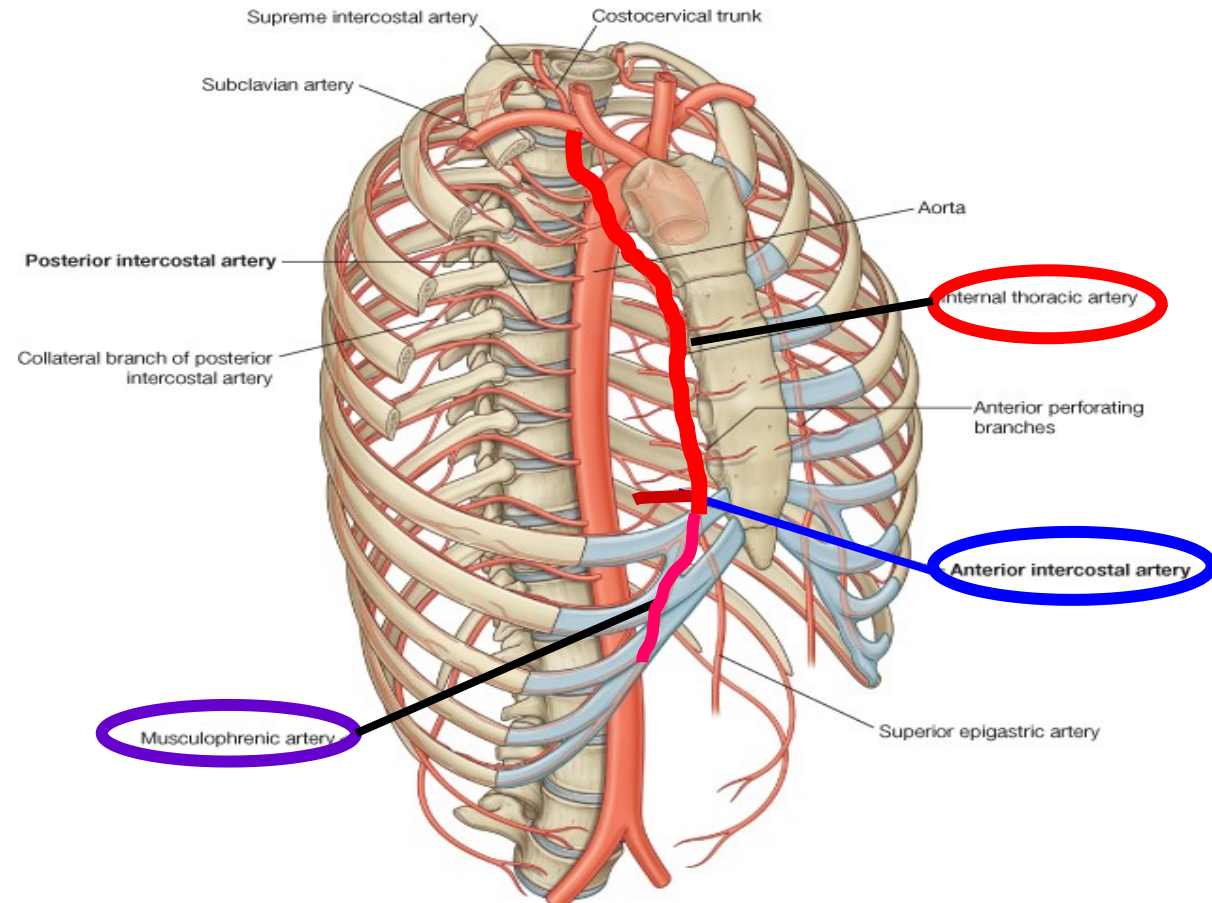


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# Anterior intercostal Arteries



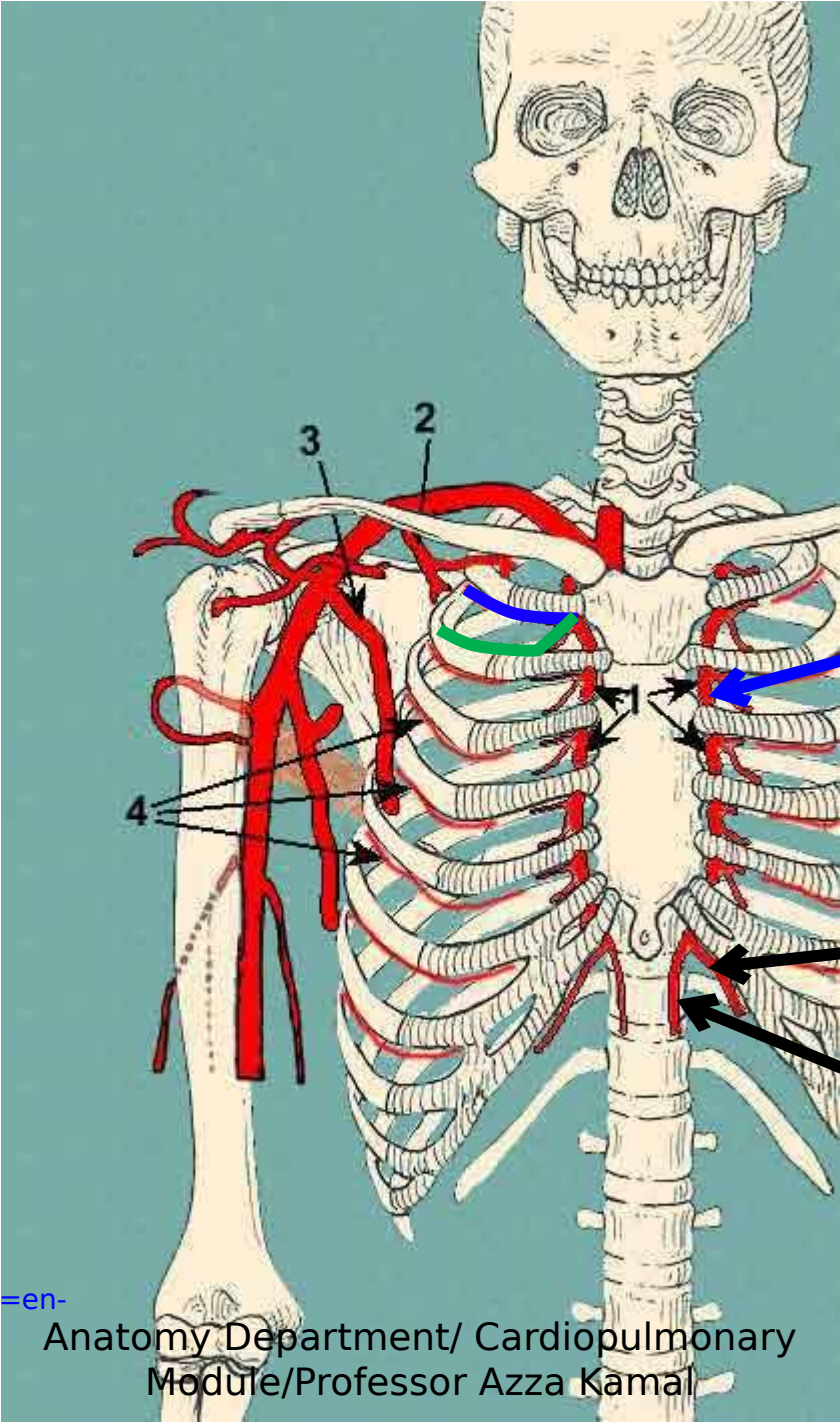
- Arteries in upper 6 spaces are brs from **internal thoracic artery**
- Arteries in 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> spaces are brs from **musculophrenic artery** (one of the 2 terminal brs of int. thoracic)



<https://www.google.com.eg/search?sa=G&hl=en-EG&q=arteries+of+thoracic+wall>



**Anterior  
intercostal  
arteries**



**Internal  
thoracic  
artery**

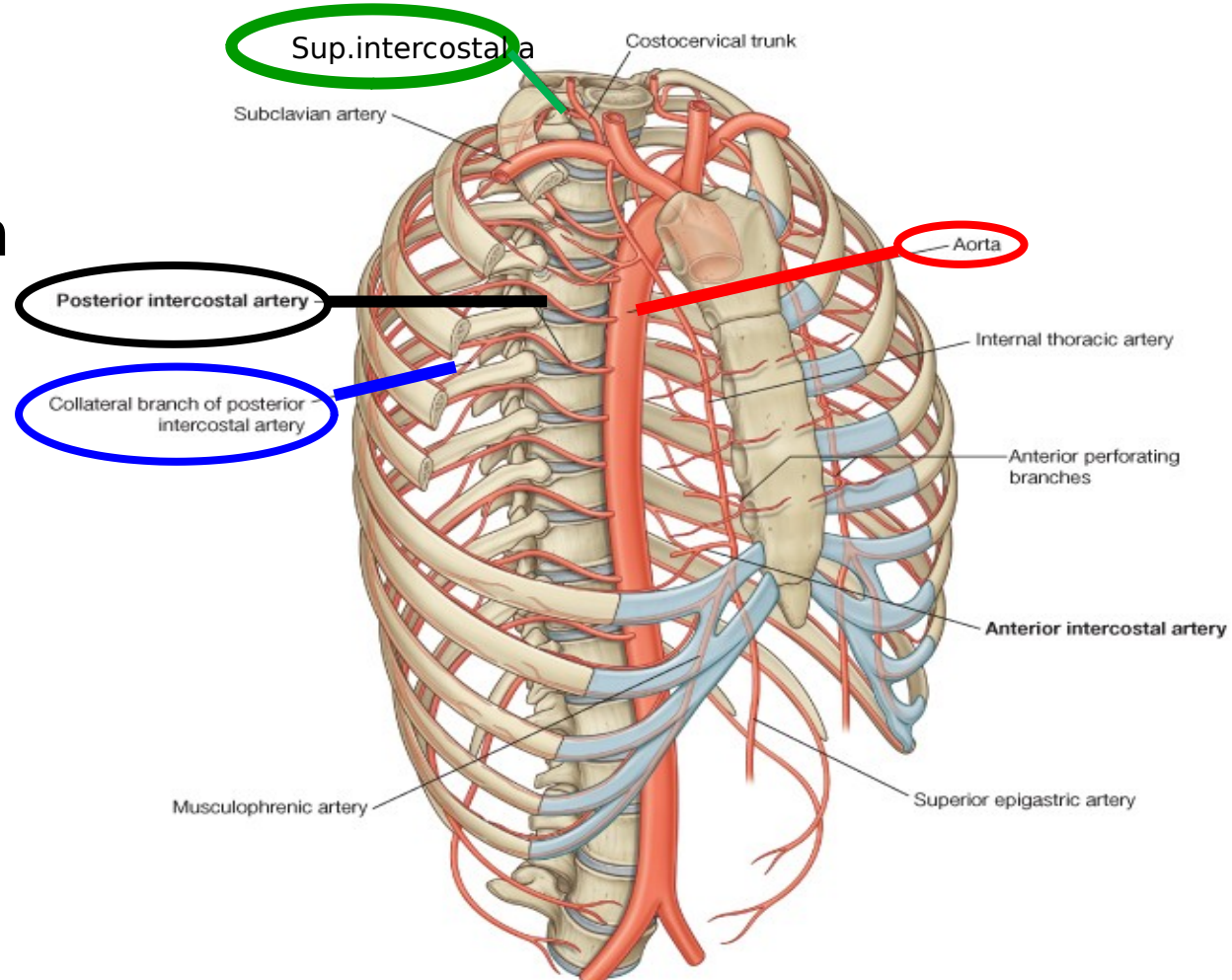
**Musculophr  
enic  
artery**

**Superior  
epigastric  
artery**

# Posterior Intercostal Arteries



- 1 artery in each of the 11 spaces
- Runs on lower border of rib above
- Gives a collateral br on upper border of rib below
- Artery of 1<sup>st</sup> & 2<sup>nd</sup> spaces □ brs of superior intercostal artery
- Arteries of 3<sup>rd</sup> to 11<sup>th</sup> spaces □ brs of descending thoracic aorta

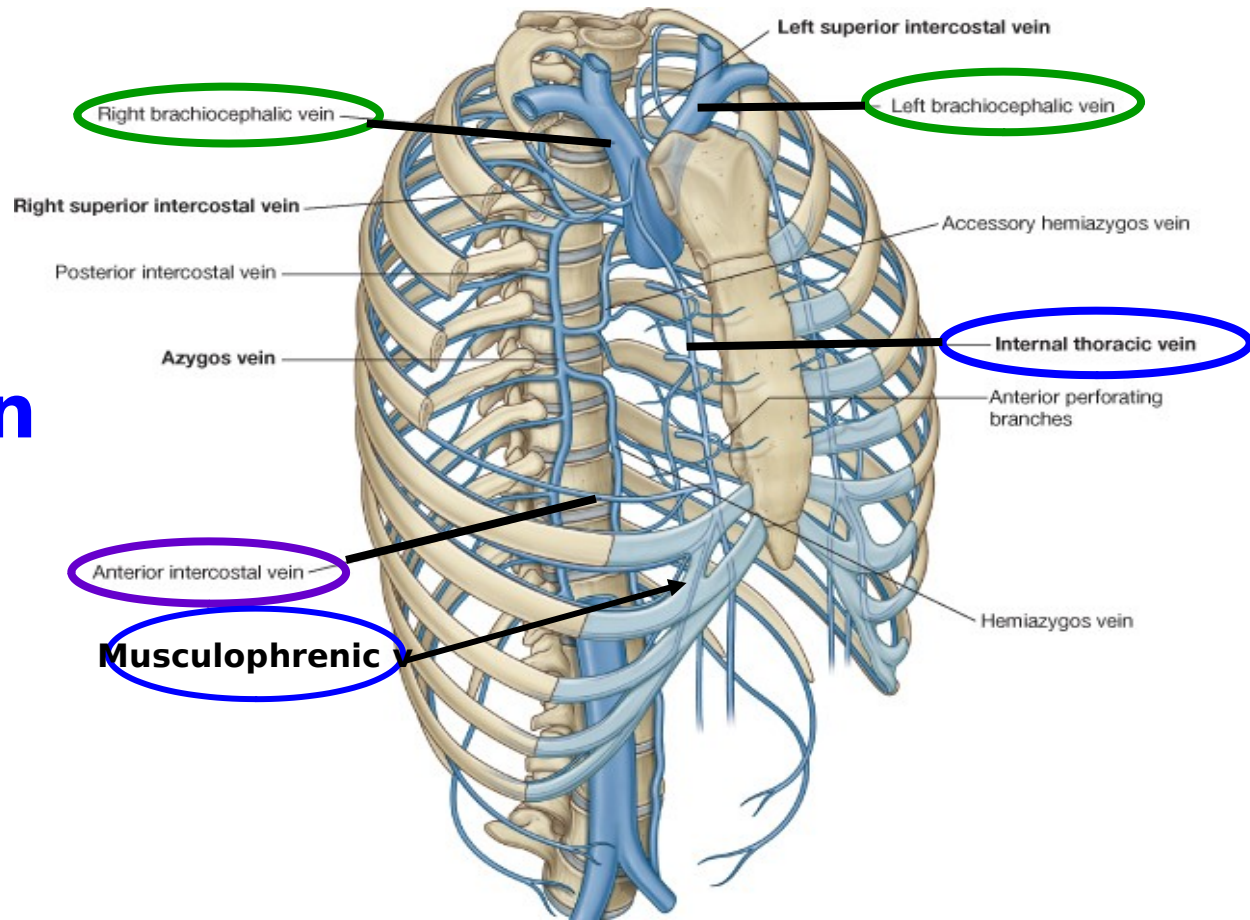


<https://www.google.com.eg/search?sa=G&hl=en-EG&q=arteries+of+thoracic+wall>

# Intercostal Veins

(1) Anterior intercostal veins □ follow the arteries.

- Veins of 7<sup>th</sup>, 8<sup>th</sup> & 9<sup>th</sup> spaces □ musculophrenic vein
- Veins of upper 6 spaces □ internal thoracic vein □ innominate (brachiocephalic) vein



<https://www.google.com.eg/search?sa=G&hl=en-EG&q=anterior+intercostal+veins>



## (2) Posterior intercostal veins

11 on each side in the costal groove above their arteries

V  
A  
N



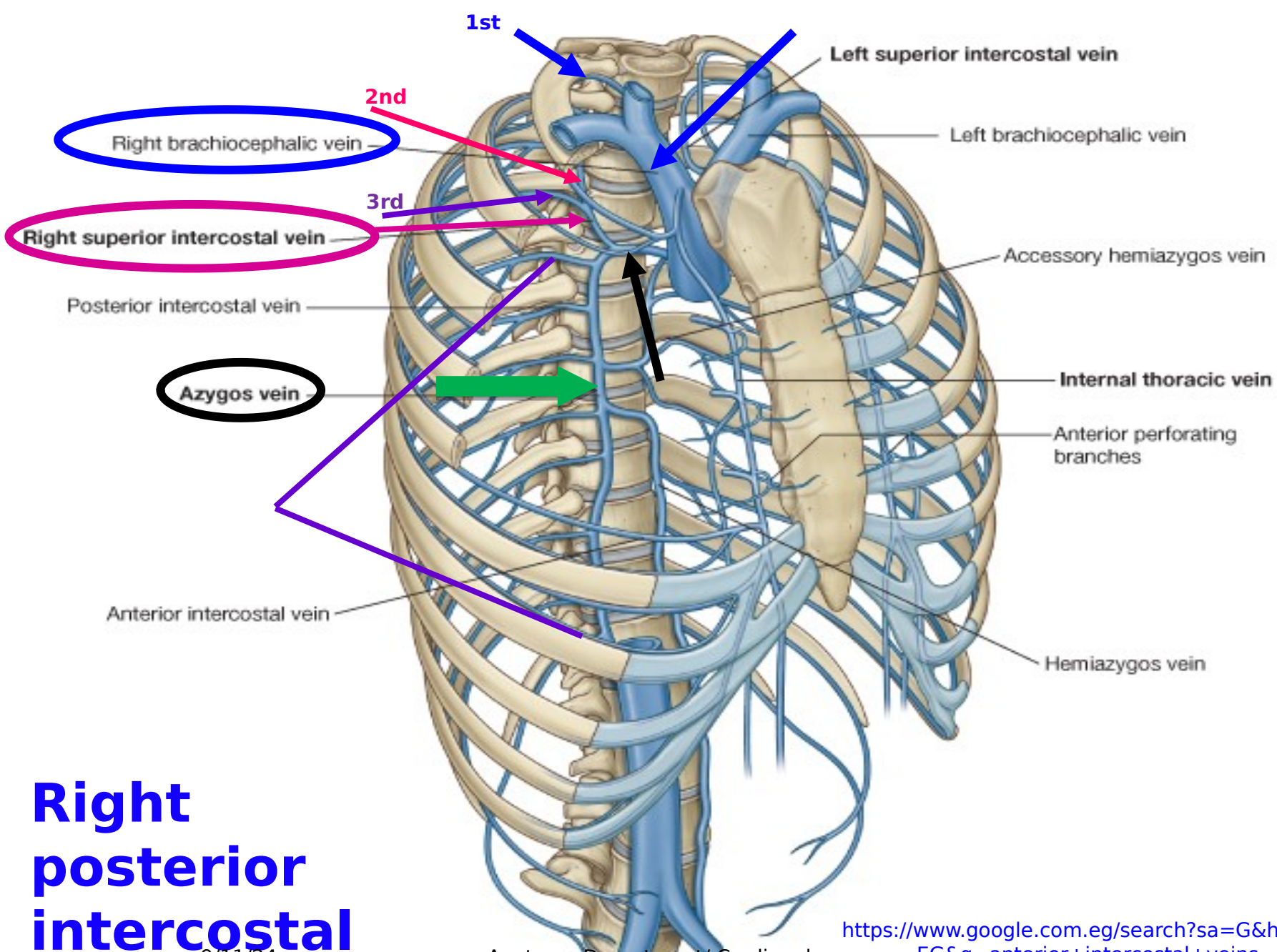
Right side	Left side
1 <sup>st</sup> □ into right brachiocephalic vein	1 <sup>st</sup> □ into the left brachiocephalic vein
2 <sup>nd</sup> , 3 <sup>rd</sup> □ unite □ right superior intercostal □ arch of azygos vein	2 <sup>nd</sup> , 3 <sup>rd</sup> □ unite □ left sup. intercostal □ left brachiocephalic vein
4-11 □ into the azygos vein	4- 8 □ into the superior hemiazygos vein □ azygos vein 9-11 □ into the inferior hemiazygos vein □ azygos vein

**Which of the following  
posterior intercostal veins  
pour directly into the azygos  
vein**

- A) First left**
- B) First right**
- ☒ C) 2nd & 3rd left**
- D) 4th to 11th right**

**MCQ tests azygos and hemiazygos  
veins**





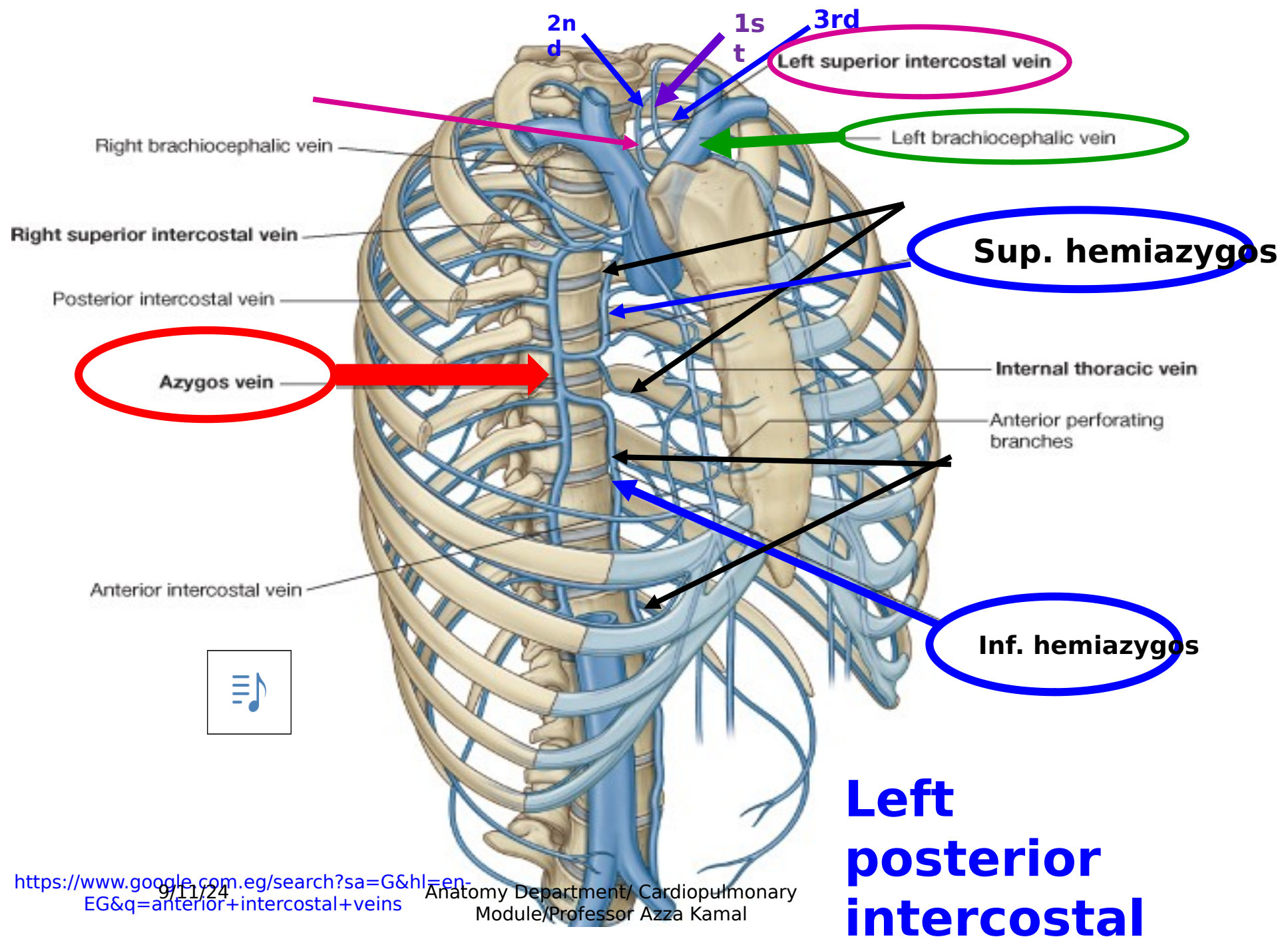
# Right posterior intercostal veins

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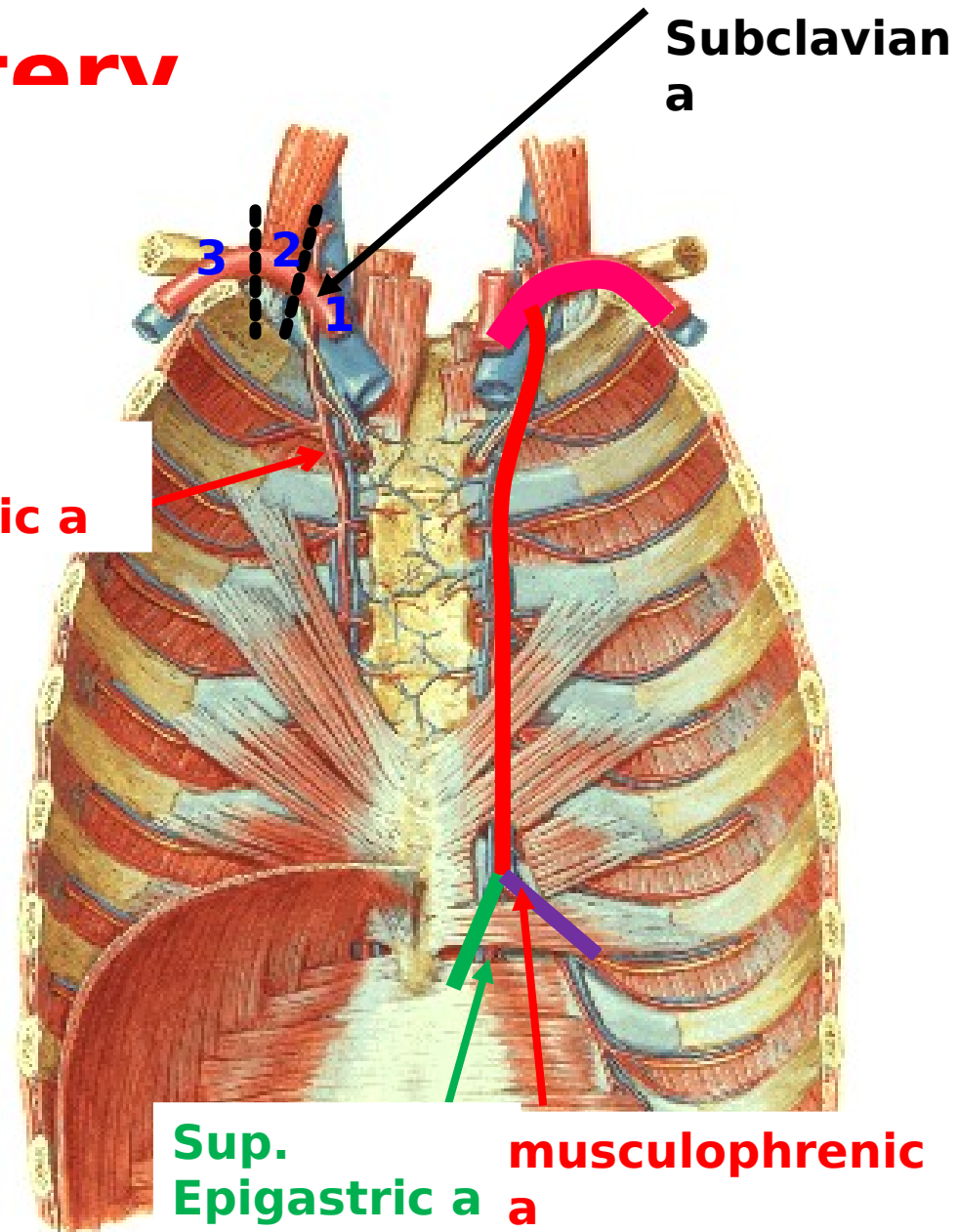
<https://www.google.com.eg/search?sa=G&hl=en-EG&q=anterior+intercostal+veins>





# Internal Thoracic Artery

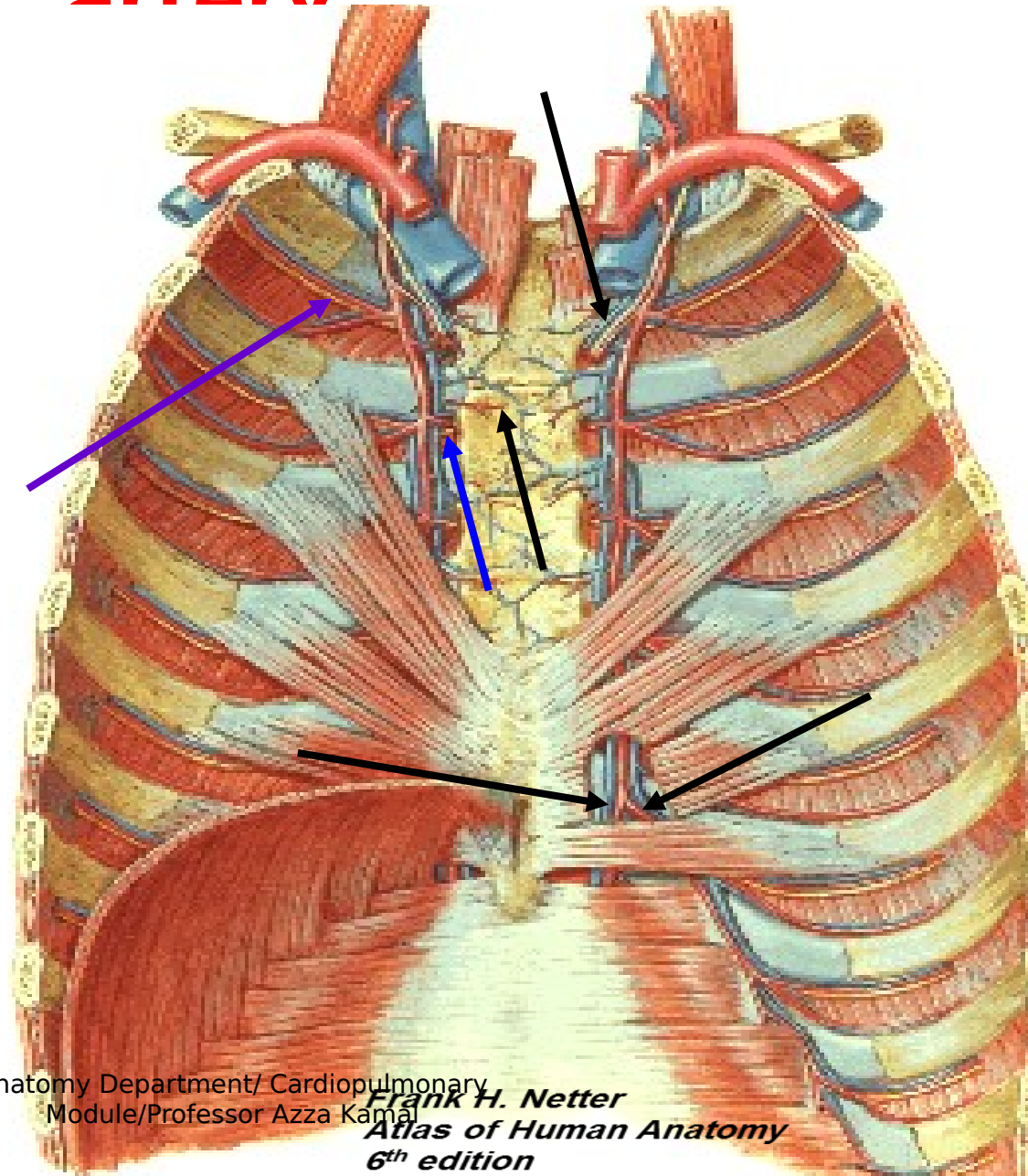
- **Origin** from 1<sup>st</sup> part of subclavian artery
- **Course** descends behind medial end of clavicle & behind upper 6 costal cartilages 1 cm lateral to the sternum
- **Ends** in 6<sup>th</sup> intercostal space in 2 terminal branches: **superior epigastric** & **musculophrenic** arteries



# Branches of internal thoracic artery



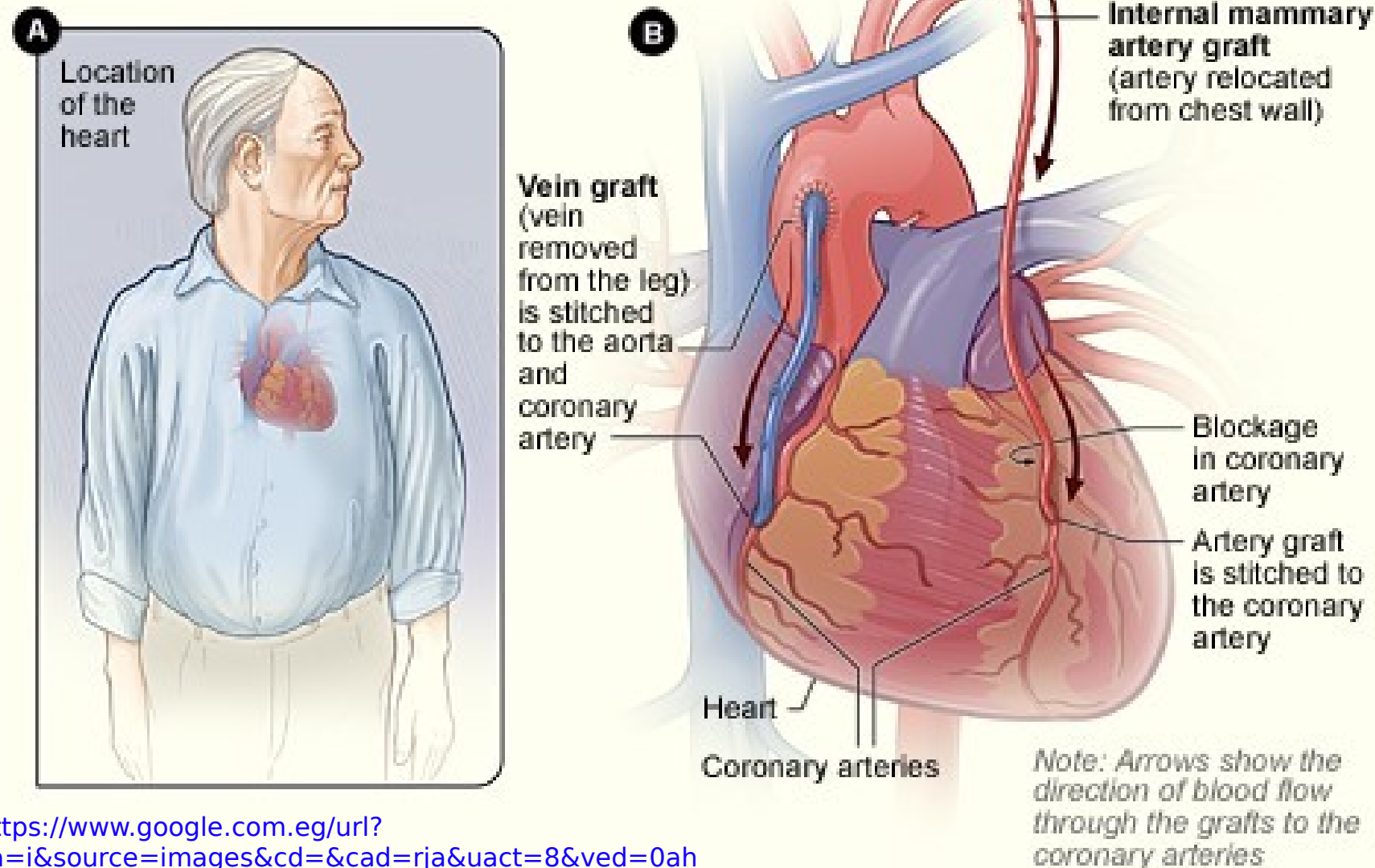
1. Pericardiophrenic artery
2. Anterior intercostal arteries
3. Perforating brs
4. Mediastinal brs
5. Terminal brs □ superior epigastric & musculophrenic



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6th edition



<https://www.google.com.eg/url?sa=i&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwj->

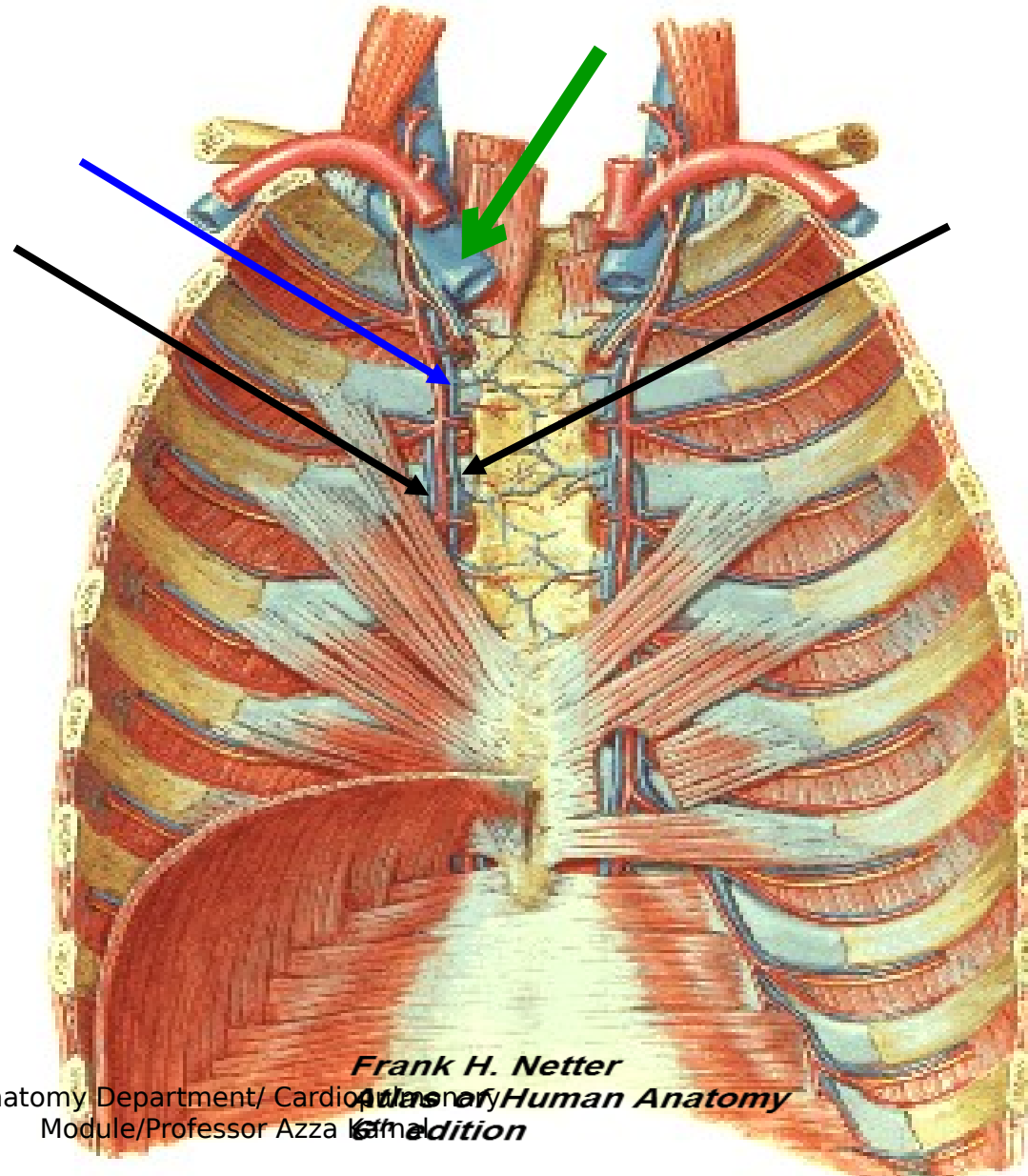
**Internal thoracic artery (internal mammary) is one of the commonly used vessels in coronary bypass operations.**

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# Internal Thoracic Vein

- **Formed by** union of 2 venae comitantes of internal thoracic artery.
- **Ends in** the brachiocephalic ( innominate ) vein



# SUMMARY



<ul style="list-style-type: none"> <li>arteries in upper 6 spaces → int. thoracic a</li> <li>arteries in 7,8,9 spaces → brs from musculophrenic a</li> </ul>	No arteries in last 2 spaces	arteries in each 2 space	Ant. intercostal arteries
<ul style="list-style-type: none"> <li>Arteries in 1<sup>st</sup> &amp; 2<sup>nd</sup> spaces → brs from sup. Intercostal arteries</li> <li>Arteries in 3<sup>rd</sup> -</li> </ul>	Present in all 11 spaces	One artery in each space	Post. intercostal arteries
<ul style="list-style-type: none"> <li>Veins in 7,8,9 spaces → drain into musculophrenic vein</li> <li>Veins in upper 6 spaces drain into int. thoracic → brachiocephalic vein</li> </ul>	Follow anterior intercostal arteries	Anterior intercostal veins	
On Left side: 1 <sup>st</sup> → into the left brachiocephalic vein	On Right side: 1 <sup>st</sup> → into right brachiocephalic vein	Posterior intercostal veins	
2 <sup>nd</sup> , 3 <sup>rd</sup> → unite → left sup. Intercostal vein → left brachiocephalic vein	2 <sup>nd</sup> , 3 <sup>rd</sup> → unite → right superior intercostal → arch of azygos vein		
4- 8 → into the superior hemiazygos vein → azygos vein	4-11 → into the azygos vein		

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# SUMMARY

<b>Ends in 6<sup>th</sup> intercostal space by dividing into 2 brs □ superior epigastric &amp; musculophrenic</b>	<b>origin from 1<sup>st</sup> part of subclavian artery</b>	<b>Internal thoracic artery</b>
<b>Ends into brachiocephalic vein</b>	<b>Formed by union of 2 venae comitantes of internal thoracic artery</b>	<b>Internal thoracic vein</b>

# It's MCQ Time

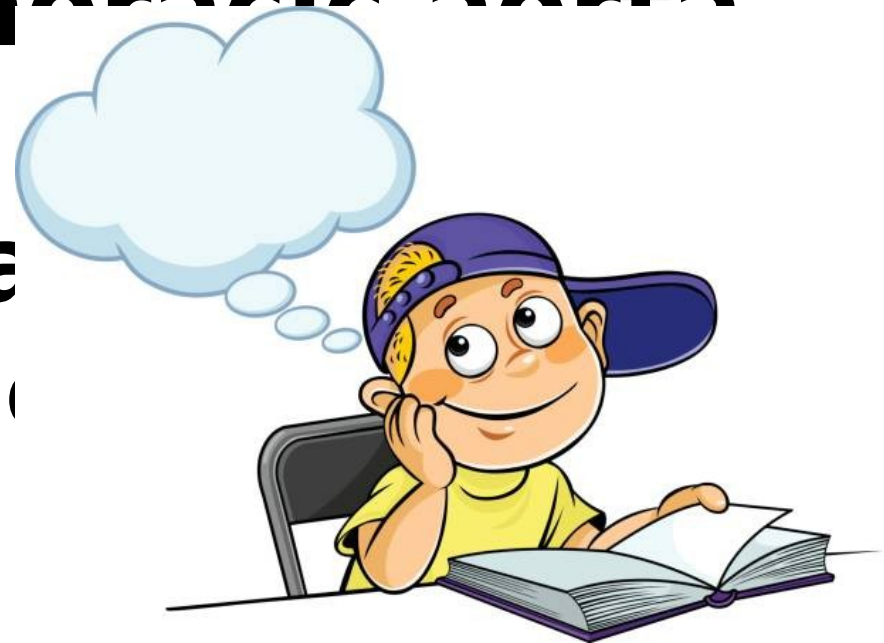


**The anterior intercostal arteries in the upper 6 spaces are branches from:**



- A) Descending thoracic aorta**
- B) Musculophrenic artery**
- C) Superior epigastric artery**
- D) Internal thoracic artery**
- E) Subclavian artery**

**MCQ tests intercostal arteries**

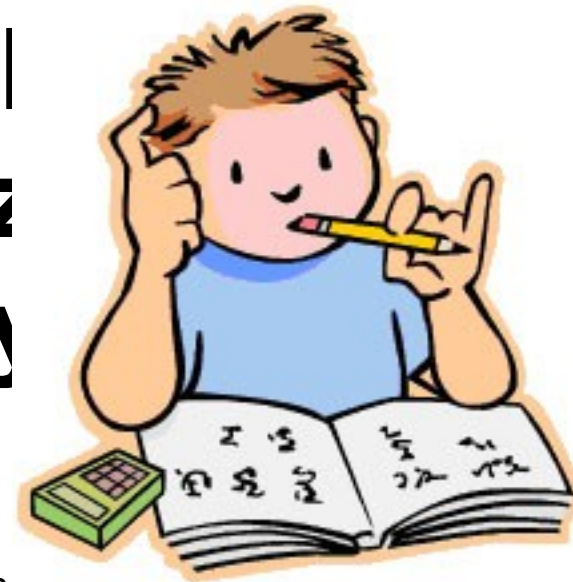


**The first left posterior intercostal vein drains directly into the following vein:**



- A) Left superior intercostal**
- B) Left brachiocephalic**
- C) Superior hemiazygos**
- D) Inferior hemiazygos**
- E) Azygos**

MCQ tests intercostal veins



**Which of the following is a terminal branch of internal thoracic artery?**

**A) Pericardiophrenic**

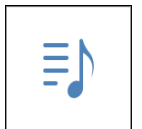
**B) Mediastinal**

**C) Perforating**

**D) Superior epigastric**

**E) Anterior intercostal**

MCQ tests internal thoracic artery



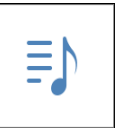


***Suggested Textbook:***

*Clinical Anatomy for Medical Students*

*Richard S. Snell*

*Pages 69-74*



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